DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, NORTHEAST
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO
5090
Code EV21/JLC

07 OCT 2005

Mr. Larry Rosenmann
New York State Department of Environmental Conservation
Division of Solid and Hazardous Materials
625 Broadway, 8th Floor
Albany, New York 12233-7252

Dear Larry:

Subj: Draft Pilot Study Results Report and Workplan for Full-Scale Installation of the Air Sparging/Soil Vapor Extraction (AS/SVE) System for Installation Restoration (IR) Site 7 - Fuel Depot Area; Naval Weapons Industrial Reserve Plant (NWIRP) Calverton, New York

The Navy is forwarding the enclosed Draft Report for your review. This report summarizes the activities conducted to install and operate a pilot scale AS/SVE system at IR Site 7 for a 3-month period to address fuel-related groundwater contamination in soils and shallow groundwater.

During the operation of the pilot-scale system, some remediation of the site did take place. The enclosed report details how much remediation occurred and also includes a draft workplan to enlarge the system to address other portions of Site 7 not previously addressed by the pilot-scale system. The Navy asks that you review the draft workplan as well.

The data contained within the enclosed report as well as the recommendations to enlarge the system were presented at two Restoration Advisory Board (RAB) meetings held in April and August 2005.

Upon finalization of the draft workplan, the Navy's remediation contractor, Tetra Tech EC, Inc. (TtEC), will proceed with installation of the full-scale AS/SVE. A draft Operations & Maintenance (O&M) Manual will then be submitted detailing the actions necessary to operate the AS/SVE system in order to achieve the goals established in the Navy's Record of Decision (ROD) for Operable Unit 2 dated November 2002. Please remember that the AS/SVE technology was chosen for source-area remediation and it is anticipated that natural attenuation with monitoring will likely follow after it is determined that the AS/SVE system is no longer efficiently removing contaminants.

If you have any questions regarding the enclosed draft summary report or workplan, please contact me at (610) 595-0567, extension 163. Any comments that you may have should be submitted in writing and can be sent to me by mail to the address shown above or by fax to (610) 595-0555 or by email to james.colter@navy.mil.

Sincerely,

James L. Colter

JAMES L. COLTER, P.E.
Remedial Project Manager
By direction of the
Commanding Officer

Enclosure: (1) Draft Pilot Study Results Report and Workplan for Full-Scale Installation of the Air Sparging/Soil Vapor Extraction (AS/SVE) System for Installation Restoration (IR) Site 7 - Fuel Depot Area dated October 7, 2005 (with CD version enclosed)

Distribution: (CD Only unless noted)

NYSDEC (Albany), Henry Wilkie (Hard Copy & CD)
NYSDEC (Stony Brook), Walter Parish
NYSDOH, Wendy Kuehner
SCDHS, Sy Robbins (Hard Copy & CD)
EPA Region II, Carol Stein
EPA Region II, Carla Struble
NAVAIR, Joe Kaminski
ECOR Solutions, Inc., Al Taormina
ROICC New London, Bob Ingram (Hard Copy & CD)
Town of Riverhead, Andrea Lohneiss
RAB Community Co-Chair, Bill Gunther (w/o enclosure)

DRAFT
PILOT STUDY RESULTS REPORT
AND
WORK PLAN FOR FULL SCALE INSTALLATION AND OPERATION
FOR
SOIL VAPOR EXTRACTION/AIR SPARGING SYSTEM
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
CALVERTON, NEW YORK

CONTRACT NO. N62472-99-D-0032
CONTRACT TASK ORDER NO. 0075

Prepared for:

Department of the Navy
Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Prepared by:

Tetra Tech EC, Inc.
2300 Lincoln Highway East
One Oxford Valley, Suite 200
Langhorne, PA 19047-1829

Issued:

September 6, 2005

Revision	Date	Prepared by	Approved by	Pages Affected
0	9/6/05	R. Arnold	S. Patselas	All

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

ABS	Acrylonitrile Butadiene Styrene
acfm	actual cubic feet per minute
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	Benzene, Toluene, Ethyl Benzene, Xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CMP	Complete Manifest Package
CPM	Critical Path Method
CPR	Cardiopulmonary Resuscitation
CTO	Contract Task Order
DO	Dissolved Oxygen
EFANE	Engineering Field Activity, Northeast
EHS	Environmental Health and Safety
EPCRA	Emergency Planning and Community Right-to-Know Act
ESQ	Environmental, Safety, Quality
FI	Facility Investigation
FI/CMS	Facility Investigation/Corrective Measures Study
FS/CMS	Feasibility Study/Corrective Measures Study
HDPE	High Density Polyethylene
IR	Installation Restoration
LEPC	Local Emergency Planning Committee
mg/kg	milligrams per kilogram
MSDS	Material Safety Data Sheet
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
NWIRP	Naval Weapons Industrial Reserve Plant
NYCRR	New York Conservation Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PESM	Project Environmental and Safety Manager
PID	Photoionization Detector
PMO	Program Management Office
PPE	Personal Protective Equipment
ppm	parts per million
PQCM	Program Quality Control Manager
PRG	Preliminary Remediation Goal

PS	Project Superintendent
psi	pounds per square inch
PVC	Polyvinyl Chloride
QC	Quality Control
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer In Charge of Construction
RQ	Reportable Quantity
SAP	Sampling and Analysis Program
SERC	State Emergency Response Center
SHSO	Site Health and Safety Officer
SHSP	Site-Specific Health and Safety Plan
SQCM	Site Quality Control Manager
SVE/AS	Soil Vapor Extraction/Air Sparging
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TBC	To Be Considered
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOX	Total Organic Halogen
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
TtEC	Tetra Tech EC, Inc.
TtNUS	Tetra Tech NUS, Inc.
µg/L	micrograms per liter
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VGAC	Vapor-Phase Granular Activated Carbon
VOC	Volatile Organic Compound
VSD	Variable Speed Drive

1.0 WORK DESCRIPTION

1.1 Project Background

Tetra Tech EC, Inc. (TtEC) has prepared this Pilot Study Results Report and Work Plan for Full Scale Installation and Operation for Soil Vapor Extraction/Air Sparging (SVE/AS) System for remediation of volatile organic compound (VOC) in soil and groundwater. The remediation will take place at Site 7, the Former Fuel Depot, located at the Naval Weapons Industrial Reserve Plant (NWIRP) in Calverton, New York. The Pilot Study Results Report and Work Plan for Full Scale Installation and Operation for Soil Vapor Extraction/Air Sparging has been prepared for Contract Task Order (CTO) Number 0075 under Remedial Action Contract (RAC) Number N62472-99-D-0032 with Engineering Field Activity, Northeast (EFANE).

1.2 Facility Description

The site is located within the confines of NWIRP Calverton, Suffolk County, (Long Island) New York (see Figure 1-1 Site Location Map and Figure 1-2 Site Layout Map) on Long Island about 70 miles east of New York City within the municipality of Riverhead.

Site 7, the Former Fuel Depot, is located approximately 3,000 feet north of the south gate entrance, near the geographic center of the NWIRP Calverton facility. It is located on the east side of the road leading from the south gate entrance. The principal visual features of this inactive site are the perimeter fencing, the level ground surface, old fuel storage, filtration, pumping, and dispensing facilities, and the pilot study treatment system with equipment, remediation building and electrical control building.

The area surrounding Site 7 contains a combination of structures and open ground. A building and paved parking area is located north of the site. An undeveloped, wooded area that is owned by the Navy is located to the east and south of Site 7. A paved roadway leading from the NWIRP south gate entrance is adjacent to west side of the site. Further west of the site, on the opposite side of the roadway, are a storage building and the former fuel system laboratory building.

1.3 Previous Environmental Activities

A series of site-related environmental activities have been conducted and are summarized below:

- A Resource Conservation and Recovery Act (RCRA) Facility Investigation (FI) has been performed to delineate the extent of contamination and to gather other contaminant related information.
- A baseline human health risk assessment was performed as part of the RCRA FI during a Stage 3 RCRA Facility Investigation/Corrective Measures Study (FI/CMS) of the Navy's Installation Restoration (IR) Program.

- Regulatory agencies reviewed the RCRA FI and accepted the RCRA FI Preliminary Remediation Goals (PRGs) upon which the project objectives are based.
- TtEC performed a Pre-Design Investigation (October 2002 through February 2003) and prepared a Draft Report for Phase I Pre-Design Investigation dated April 22, 2003.
- TtEC prepared a Final Work Plan for Pilot Testing a Soil Vapor Extraction/Air Sparging System dated July 7, 2004 that included engineering drawings. The Final Work Plan for Pilot Testing a Soil Vapor Extraction/Air Sparging System was reviewed by the regulatory agencies and accepted.
- TtEC installed, started, operated and maintained a Pilot Test System at the site during a period of three months starting March 30, 2005 and continuing to July 1, 2005. As a part of the pilot study, TtEC obtained pilot test data and performed remediation to the extent practical. The results of the pilot test study are reported in Section 2.0.

1.4 Project Objectives

The overall objective of this project is to mitigate the Site 7 targeted soil and groundwater contaminant concentrations in the most cost-effective manner. The specific technical objectives are to 1) utilize active remedial technologies to reduce the targeted concentrations to levels acceptable for natural attenuation, 2) further reduce the targeted concentrations to the PRGs using remediation by natural attenuation and 3) obtain regulatory approval for no further action at Site 7. This Pilot Study Results Report and Work Plan for Full Scale Installation and Operation for SVE/AS System addresses Technical Objective 1.

1.5 Action Levels

In order to achieve all three specific technical objectives, the targeted contaminant concentrations must be reduced to concentrations at or below the accepted PRGs. These PRGs are provided in the Tetra Tech NUS, Inc. (TtNUS) Feasibility Study/Corrective Measures Study (FS/CMS) Report dated January 2001 and are summarized below.

Chemical Constituent	Preliminary Remediation Goals	
	Soil - mg/kg	Groundwater - ug/L
Benzene (B)	*	1
Ethyl Benzene (E)	0.55	5
Toluene (T)	0.15	5
Xylenes (X)	0.12	5
Freon (F113)	*	5
Naphthalene (N)	*	10

- * - No PRG developed
- mg/kg – milligrams per kilogram
- ug/L – micrograms per liter
- BTEX – benzene, toluene, etyl benzene, xylenes

1.6 Remedial Approach

The remedial approach to be implemented under this Pilot Study Results Report and Work Plan for Full Scale Installation and Operation for SVE/AS System is designed to accomplish Technical Objective 1 (utilize active remedial technologies to reduce the targeted concentrations to levels acceptable for natural attenuation).

The selected remedial approach is driven by findings obtained during the previous site activities. The selected technologies are SVE and AS methods, with ozone supplementation. It should be noted that SVE and AS technologies are an United States Environmental Protection Agency (USEPA) standardly acceptable remedy for sites with VOCs in groundwater.

1.6.1 Surface Conditions

Site 7 is operationally inactive and covers an area of about 2-acres with a width (north-south) of about 230-feet and a length (east-west) of about 380-feet. The site is generally level, well drained and is secured with perimeter chain-link fencing and lockable vehicular gates. Portions of the ground surface are covered with crushed stone, sandy soil, grass, concrete, and the remains of out-of-service facilities. The surface remains of the old fueling facility include abandoned aboveground fuel pipes and supports, an out-of-service fuel filtration building, piping stub-ups, an out-of-service dispensing area with old dispensers and concrete islands, and a dispenser area canopy.

At the ground surface, there is no visual or olfactory evidence of the presence of contaminants.

1.6.2 Subsurface Conditions

The depth to groundwater has been found to range typically between 15 to 20 feet below ground surface (bgs).

Site 7 is underlain by sandy soils whose hydraulic and pneumatic conductivities, while generally high, vary with gradation, silt content and density. TtEC did not encounter plastic (clayey) soils at the site in the zone of remedial concern during pre-design investigations and environmental well installations.

In the vadose zone, TtEC encountered coarse to fine sands with traces of silt and traces of medium to fine gravel. TtEC encountered sands that were somewhat finer (coarse minus medium plus fine sand rather than the overlying well graded coarse to fine sand) in overall gradation and whose silt contents were somewhat higher (10% increase by weight) in the saturated zone at depths greater than 15-20 feet bgs, within seams and layers that varied somewhat in elevation and thickness. These seams and layers of finer soils were found to be interspersed with layers of coarse to fine sands similar to those encountered in the vadose zone. Although the differences in gradation between the coarser and finer sands are subtle, they are sufficient to impact the pneumatic properties of the soils within the zone targeted for remediation.

The site subsurface soils in the remediation zone form an overall stratigraphic unit that is not homogeneous and isotropic due to the following subtle differences: 1) variations in gradation within soil layers and seams across the site; 2) variations in the depths and thicknesses of soil layers and seams across the site; 3) filling of the site tank field area after the tanks were removed; and 4) the directional mode of soil particle deposition at the time the soil strata were formed. Rather, the remediation zone is non-homogeneous and is vertically and horizontally anisotropic.

1.6.3 Remedial Conditions

The contaminant conditions that exist at the site have been previously reported in the Remedial Investigation and Pre-Design Investigation Reports. However, there are some specific remedial conditions that should be noted and are listed below:

- **Microbial Activity -** With regard to the potential for useful microbial activity, groundwater dissolved oxygen concentrations and heterotrophic plate counts have been very low at the site. At these low levels, the bio-attenuation potential is very limited. With exception to one known location, there are other conditions (temperature, pH, micro-nutrient concentrations, lack of toxicity) across the site that will support helpful microbial activity. The one known location where these conditions do not currently exist is beneath a subsurface slab that previously served as an underground storage tank (UST) foundation or tank tie-down pad. Based on micro-toxicity assays that have been performed, the existing conditions are overly toxic for the health of microbial activity beneath this slab.

- **Contaminant Characteristics -** With regard to the selection of active remedial technologies for reduction of targeted contaminant concentrations, five of the six contaminants will respond to well-implemented SVE and AS approaches. Benzene, toluene and xylenes are mitigated efficiently with SVE and AS techniques, and although somewhat less susceptible to SVE and AS techniques, both ethylbenzene and naphthalene will still respond reasonably well. In addition, all five contaminants are well-degraded by microbial activity. However, Freon, which is very soluble in groundwater, can be difficult to mitigate, and may be less susceptible to SVE and AS techniques than the other contaminants.
- **Former Fueling Operations -** During the former fueling operations, fuel was conveyed from storage into the filtration building through four underground fuel pipes. After filtration, the fuel was then conveyed from the filtration building to the dispenser area through four other underground pipes. Based upon examination of the pipes after gaining access through their stub-ups, it is apparent that mitigation is appropriate. The pipes run underground beneath the former filtration building and beneath the dispenser area.

1.7 Status of the Project

At this time, the three-month pilot study has been completed, a significant amount of remediation has been accomplished within the pilot study time period, and the upgrade to full-scale remediation has been evaluated, planned, and is ready to proceed.

2.0 PILOT STUDY

During March 2005, TtEC collected baseline environmental measurements in the pilot study area of the site and performed system start-up preparations. During the months April 2005 through June 2005, TtEC operated and maintained the pilot system, obtained pilot study information, and performed remediation to the extent practical. In July 2005, follow-up measurements were obtained and monitoring was performed.

A Pilot Study Results Report of the 2005 Site 7 remediation pilot study is presented below.

2.1 Pilot Study System Description

The pilot study system has been described in detail in the previously submitted Final Work Plan for Pilot Testing a SVE/AS System dated July 7, 2004. A summary description of the pilot system is provided below:

- **Electrical Equipment** - Three-phase, 480-volt power was run into Site 7 from the former Fuel Lab Building located across Grumman Blvd. The power lines were contained in aboveground conduit with exception to the street crossing where the lines were run underground. The power was brought to the electrical shed where it was conditioned with a transformer and used to supply office utilities, remediation building power panels, and two variable speed drive (VSD) units. From the panels and VSDs, the power was run through underground conduits into remediation building conduits and through them to the SVE Blower, the AS blower, building lights, utility outlets, power ventilator, instruments and controls. All of the electrical work and equipment in the remediation building was suitable for electrically hazardous (i.e. Class I, Division 2, Group D) location installation.
- **Remediation Building** – A code compliant, fabric structure building was erected near the east end of the site with roll-up doors at each end and one personnel door. This building was constructed in accordance with the requirements of the International Building Codes. The building was fitted with lighting, remediation, vapor treatment, ventilation, and pumping equipment. It was also fitted with the needed piping, conveyances, and other needed equipment and accessories. The building skirts were fastened down to the concrete slab using stainless steel batten strips, rubber boots were installed through the fabric at air duct penetration locations, spill containment was installed for a moisture knockout tank, and the building frame was provided with sufficient strength to support process piping hangers.
- **SVE Blower** – The SVE blower was sized and installed to provide a total extracted airflow rate up to 1200 cubic feet per minute (cfm) at wellhead vacuum pressures equal to 50-inches of water. The blower was installed with an inlet filter silencer, dilution/inlet ports with valves and filters and discharge silencer, set-point shut-off controls, and appropriate accessories and appurtenances including ducting, temperature and pressure

gauges, automatic vacuum relief, automatic pressure relief, and sampling ports. The dedicated VSD allows adjustments to the blower motor speed to allow gradual increases or decreases in extraction flow rates.

- **AS Blower** – The AS blower was sized and installed to provide a total injected airflow rate up to 180 cfm at wellhead pressures equal to 10 pounds per square inch (psi). The blower was installed with an inlet filter silencer, inlet, bypass port with valves and filter discharge silencer, set-point shut-off controls, and appropriate accessories and appurtenances including piping, temperature and pressure gauges, and automatic pressure relief. The dedicated VSD allows adjustments to the blower motor speed to allow gradual increases or decreases in extraction flow rates.
- **Moisture Knockout Tank** – A moisture tank with an operating capacity of 400 gallons of water was installed within the spill containment area upstream of the SVE blower and was fitted with a visual level gauge, automatic high level shut-off, exterior centrifugal transfer pump, and the needed piping, accessories and fittings. This tank serves to remove condensate, and even groundwater during periods of seasonally high water table elevations, prior to it reaching the blower.
- **Heat Exchanger** – A passive air-to-air finned pipe heat exchanger unit was installed outside of and directly adjacent to the remediation building. The heat exchanger inlet was connected through a rubber boot to the AS blower air supply piping, and the outlet was connected through a rubber boot to the piping used to supply the AS manifold. The unit serves to decrease the AS blower feed temperatures to prevent any damage to the high density polyethylene (HDPE) piping that distributes the pressurized air to the AS wells.
- **Extracted Vapor Treatment System** – Four 3,000 pound vapor-phase granular activated carbon (VGAC) adsorbers with flanged side-mount inlets and outlets were installed adjacent to the SVE blower. The blower exhaust are piped to flexible rubber ducts that are used to feed the vapor stream from that outlet into the first adsorber, out of the first adsorber and into the second adsorber, and out of the second adsorber and into piping that leads to an exterior exhaust stack. Two of the adsorbers are installed as spares to provide convenient and timely carbon change-out capability.
- **Ozone Injection System** – One ozone injection trailer with a capacity to inject 5-pounds of ozone per day, in a timed and pulsed operation that is directed to each of six injection points, was also used during the pilot study. The mobile system was used to inject ozone through the ozone injection points at the east end of the buried slab, and to inject ozone through an impinger tube into the monitoring well at the site of the prior Freon 113 release.
- **Conveyances** – Schedule 40 polyvinyl chloride (PVC) piping was used to convey the extracted vapors from the SVE wells through the blower and to the VGAC adsorbers. Steel piping was used to convey air from the AS blower through the heat exchanger to an acrylonitrile butadiene styrene (ABS) airline piped control manifold that extended to the building exterior and from there HDPE piping was used to convey the air to the AS wells.

Flexible polyethylene tubing inside PVC sheathing was used to convey ozone from the ozone trailer to the location of the ozone injection points.

- **SVE Wells** – Eight 4-inch diameter, dual-purpose SVE wells were used during the pilot study. Dual-purpose SVE wells are suitable for monitoring as well as SVE use. One additional SVE well that had been previously installed was converted to a monitoring well (MW20S) for future use. All of the SVE wells were designed to provide focused soil pore vapor removal from the lower third of the vadose zone (from water table elevation up to 5 feet above water table). The screens in each well were extended down into the water table at the time of installation to provide capability for groundwater monitoring.
- **AS Wells** – Eighteen 2-inch diameter, AS wells were used during the pilot study. All of the AS wells were designed to initiate the release of sparged air below the zone of contaminant concern, to accommodate the maximum practical airflow rates, and to provide the maximum practical radius of influence.
- **Ozone Injection Wells** – As part of the ozone testing program, six ozone injection wells were used during the pilot study. In addition, ozone was injected into one Freon source area monitoring well (MW405S) through a sealed impinger pipe. The injection wells were 1-inch steel risers connected to 1-inch stainless steel screens that were driven into place in the target zone beneath the eastern end of the buried concrete slab.
- **Monitoring Wells** – Groundwater samples from three monitoring wells were collected during the pilot study. The location of one of the wells was in the vicinity of a prior Freon 113 release. Two of the wells were installed through the buried concrete slab and were screened in the heavily contaminated zone beneath the slab.

2.2 Pilot System Operation and Maintenance

The operation and maintenance (O&M) of the pilot study system has been described in detail in the document entitled Draft Operations and Maintenance Manual for Soil Vapor Extraction/Air Sparging System dated June 3, 2005.

A summary O&M description is provided below:

- **SVE/AS System Start-up** – The start-up began with of a review of the electrical prerequisites, instrumentation prerequisites, and mechanical prerequisites. After this check, a brief power-up (pre-start-up test) was performed to verify basic functions of the power supply, motors, blowers, lubricants, VSDs, set-point controls, instruments, and process controls. The results of the brief power-up were evaluated, and the system was started again. Both blowers were then operated to full unloaded function in a series of timed steps using the VSDs. During the step-up procedures, the controls and instruments were checked, unloaded blower performance was verified, and power consumption was verified. The blowers were then stepped down to about 1/5 of their capacity, were loaded by engaging the system conveyances and gradually closing bypass and exhaust valves, and were allowed to run until temperatures and pressures remained constant. From that point, the blowers were stepped up to full loaded function using the VSDs, and were allowed to run until temperatures and pressures remained constant. The equipment start-up sequence was then complete.

- **Ozone System Start-up** – The ozone system startup began with a review of the ozone system components and their operation. The system was started up briefly to verify system function. Then the system was connected to one of the ozone injection points, started and allowed to warm up and continue running. The system controls, monitoring equipment, performance parameters, and operating ranges were reviewed during the initial phase of the system operation. The system was then connected to additional injection points and the ozone injection testing proceeded.
- **Continuous Operations** – During the pilot test operations, the SVE and AS systems were subjected to multiple adjustments and test sequences that are described subsequently. While the testing was ongoing, the system was inspected periodically, controls and instruments were checked, motor and blower function was checked, and pressures and temperatures were checked to ensure that the operating conditions remained within the blower design limits. The SVE and AS blowers were found to operate positively and without difficulty, and they were found to perform to the standards required by the system design.
- **Ongoing Maintenance** – The required maintenance activities included checks of lubricant levels, management of the moisture knockout tank, management of the carbon treatment system, and management of moisture that collected at times in the SVE influent pipes. The carbon treatment system was managed without difficulty and change-outs were performed easily, except for the need to remove and re-mount heavy flanges that were connected to the ends of the flexible tube conveyances. During most weeks of operation, the moisture knockout tank operated with very little attention, but after storm events it was found to accumulate condensate rapidly. In addition, the SVE influent conveyances were also found to accumulate unwanted volumes of moisture after storm events. Also, the noise levels produced by the AS blower inlet at the west side of the remediation building were high and required hearing protection inside the building.
- **System Alterations** – In order to reduce the difficulty in handling heavy flanges in the midst of carbon change-outs, these flanges will be removed and replaced with lighter flanges during the system upgrade work. As a means of easing the management of influent moisture after storm events, the main SVE influent pipe was fitted with a self-equalizing gravity drain-back tube. This drain worked effectively and there was very little effort expended in SVE condensate management after the drain was installed. To reduce AS blower inlet noise impacts across the site, the AS blower inlet was re-installed using much of the original piping and was routed out of the remediation building through a boot on the south end of the building where there were no obvious noise receptors.
- **Project Controls** – During the O&M work at the site, the Final Site-Specific Health and Safety Plan (SHSP) for Pilot Testing a Soil Vapor Extraction/Air Sparging System dated September 16, 2004 and the environmental protection provisions presented in the Final Work Plan for Pilot Testing a Soil Vapor Extraction/Air Sparging System dated July 7,

2004 were in effect. There were no accidents or incidents during the installation or O&M phases of the work.

2.3 Pilot Testing, Monitoring and Measurement

During the pilot test, the monitoring and measurement provisions of the Final Work Plan for Pilot Testing a Soil Vapor Extraction/Air Sparging System dated July 7, 2004 were in effect. SVE, AS and ozone testing was performed, pilot system impacts to the site subsurface were measured and monitored, the performance of system components was measured and monitored, and remedial progress was evaluated. The monitoring and measurement activities are summarized below.

2.3.1 Baseline Data

- Before the pilot testing began, baseline measurements were performed across the site with field instruments. Vapor levels in all eight of the soil gas points were measured with a photoionization detector (PID). Wellhead vapor levels were obtained with a PID at all eight of the SVE wells and at all eighteen of the AS wells. In-situ dissolved oxygen (DO) measurements were obtained in all of the SVE and AS wells, and water level measurements were performed in all of the wells.
- After the baseline measurements had been obtained, groundwater samples were collected with low-flow purging techniques from all eight of the SVE wells. Groundwater quality parameters that were measured with a flow-through cell during purging included pH, temperature, oxidation reduction potential (ORP), conductivity, salinity, and turbidity.
- Monitoring wells MW-16S and MW-17S were not sampled at the outset of the pilot study, because they had already been subjected to groundwater sampling and analysis during the pre-design investigation work in January 2003. At that time, micro-toxicity assays were performed, DO measurements were performed, and the conditions at each of the two monitoring well locations were found to be poorly suited for bio-attenuation. Therefore, it was concluded that the January 2003 analyses would be reasonably representative of the conditions at the two wells at the time of pilot system startup.
- The eight soil gas sampling points were not sampled at the outset of the pilot study, because they had already been sampled using Summa canisters and analyzed for TO-15 analytical parameters in November 2004 after they were installed.

2.3.2 SVE Evaluation

- After the Site 7 baseline measurements had been completed, the SVE system was started and one after another the eight SVE wells were subjected to vacuum pressure by the system blower. All of the wells were found to function appropriately and in accordance with the design parameters that had been developed prior to the system installation.
- Radius of influence testing was performed and it was found that forty inches of water vacuum applied to an SVE wellhead resulted in an effluent flow rate of 100 actual cubic

feet per minute (acfm) and produced a capture radius of 80-feet. This is a positive performance that will result in cost savings during the upgrade to a full scale system.

- The carbon treatment system was carefully monitored and was found to perform as designed. The carbon units operated quietly, there were some limited reductions in vapor stream temperatures during treatment, the pressure drops across the carbon units were minimal, and treatment was efficient and thorough. During the pilot test, two complete carbon canister change-outs were performed and 30,000 pounds of carbon were exhausted.
- Overall, the SVE system was found to perform very much as anticipated during the design, except for the pneumatic well yields and the achieved capture radius which both exceeded the original design assumptions.

2.3.3 AS Evaluation

- After the SVE system had been tested and was fully operational, sequential testing began on the AS system.
- The AS wells supplied by the Number 1 AS supply line (AS17, AS18, AS19 and AS20) were started up one after another and then tested as a linear well group running from south to north across the site. This first group of wells was operated for a period of one week, due to the anticipated lag time between initiation of sparging and dispersal of sparge air to adjacent wells and up into the overlying zone of contamination. The lag time was as anticipated and perhaps somewhat greater than anticipated due to the presence of granular but fine-grained soils in the saturated zone. After one week of operation, the sparge effects were measurable in the adjacent line of AS wells at a distance of about 25-feet to the east.
- The AS wells supplied by the Number 2 AS supply line (AS10, AS11, AS12, AS13 and AS14) were started up one after another and tested as a linear group running from south to north across the site. This second group of wells was operated for a period of one week. After a week, the sparge effects were measurable in the adjacent line of AS wells at a distance of about 25-feet further east.
- In sequence, the groups of AS wells supplied by the other three AS supply lines were started up in the same manner as were the first two groups of wells. As with the first two groups, the AS wells all operated as designed and their operation resulted in sparge impacts at distances of 25-feet to the east and to the west.
- Once the sparge well groups had all been tested, individual AS wells were used to evaluate sparging impedance, breakout pressures, and impact radius in both north-south and east-west directions. The breakout pressures were as anticipated, impedances were somewhat greater than anticipated and impact radius in the north-south direction was somewhat greater than anticipated. Typically, an 8-psi wellhead injection pressure resulted in an injection flow rate of 15 acfm, an impact radius of 25-feet in an east-west direction, and an impact radius of 40-feet in a north-south direction. This was another

better than anticipated performance that will result in cost savings during the upgrade to a full scale system.

- Overall, the AS system was found to perform very well and as designed, with exception to the flow rates achieved under the exerted wellhead pressures and the north-south radius of impact, which both exceeded the original design assumptions.

2.3.4 Ozone Evaluation

The ozone system was used to supply oxidant to the six injection points in the vicinity of MW-17S and to an impinger tube that was mounted in MW-405S. There was insufficient time for the oxidant to clean up those locations. However, it was clear that the injection system was capable of delivering ozone effectively to and through the injection points and at injection pressures that would support a widening radius of impact as ozone began to oxidize the contaminants in the vicinity of the injection points.

2.4 Remedial Progress

- Once the needed SVE, AS and ozone testing had been performed, the systems were adjusted to maximize their ability to perform remediation in the pilot study area, progress measurements were obtained, and substantial remediation was accomplished.
- During the pilot test, monthly PID readings were performed at the SVE blower discharge sampling port. Monthly Summa canister samples were collected at the SVE blower discharge sampling port and analyzed for TO-15 analytical parameters (see Table 2-1). Summa canister samples were collected from the soil gas sampling points and analyzed for TO-15 analytical parameters at the completion of the pilot study (see Table 2-2). These data are provided in graphical form on Figures 2-1, 2-2 and 2-3, and have been evaluated. Based on the evaluation, the SVE system has completed its "first flush" of the pilot study area and the vadose zone remediation in that area is progressing well.
- Also, during the pilot test, monthly DO measurement and groundwater sampling and analysis for VOCs was performed at the SVE wells (see Table 2-3) and at monitoring wells MW16S, MW17S and MW405S (see Table 2-4). The analyses included standard plate counts and VOC analysis of the six targeted contaminants. The data obtained are provided in graphical form on Figures 2-4, 2-5, 2-6, and 2-7 and have been evaluated. Based on the evaluation, the AS system has significantly impacted the pilot study area. The DO concentrations have increased sharply, and these DO increases have led to significant increases in microbial activity as demonstrated by the standard plate count results. In addition, at every sampled well except for SV2 (sparging was very minimal in the vicinity of this well) the concentrations of the targeted contaminants in the groundwater have been sharply reduced.
- Based on the reductions in groundwater contaminant concentrations in the pilot study area, it is estimated that 75 pounds of contaminants have been removed from the groundwater. Based on the Summa canister analytical results, it is estimated that 281

pounds of contaminants have been removed through the SVE system. Based upon the exhaustion of 30,000 pounds of activated carbon in the vapor treatment system during the pilot study, and assuming that the sorption capacity of the carbon is 15% by weight, it is estimated that 4,500 pounds of VOCs were removed from the subsurface during the pilot study (it should be noted that this total includes targeted VOCs, non-targeted VOCs, and a range of volatile substances such as alkanes and esters that are not listed contaminants). In addition, it should be noted that significant microbial activity was stimulated during the pilot test, and although difficult to estimate with any certainty, it is believed that an additional mass of contaminants has been mitigated by bio-attenuation.

- Based on the above, it is clear that significant remedial progress has been made in the pilot study area, and that the utilized technologies have been proven effective in remediation of the Site 7 contaminants.

2.5 Pilot Study Findings

Based on our evaluation of the pilot study, the following findings are presented:

- Due to subtle changes in the gradation of sand formations at the site, and due to irregularity in the depth and extent of the subsurface seams and layers, the remediation zone is non-homogeneous and is vertically and horizontally anisotropic with respect to SVE and AS remediation technologies.
- Due to the presence of coarse-grained and finer-grained sand formations across the site, and due to the directional nature of soil particle deposition, AS that is conducted at depths below the zone of contamination will be subject to an anisotropic radius impact and a lag time in achieving the sparge-related remediation.
- Given the increase in DO concentrations at the site due to the AS effort, microbial populations will multiply rapidly and be capable of bio-attenuation of the targeted contaminants. The only known location where bio-attenuation may not be readily achievable is the heavily contaminated area beneath the buried concrete slab. Even this area, given sufficient sparging effort and supplemental treatment with ozone, may eventually be capable of supporting useful microbial populations.
- All five of the targeted, fuel-related contaminants have responded well to SVE/AS technology and is displayed on the previously provided figures. However, mitigation of Freon 113 may be difficult unless ozone supplementation is provided.
- We anticipate that residual contaminants are present in the eight, inactive, underground fuel pipes that stub up in the former filtration building. They may still be discharging to ground from openings in the pipes and migrating to groundwater from soil hot spots beneath the former fueling facility. Therefore, demolition of the former fuel filtration building, dispenser area and canopy, and aboveground fuel pipe remnants and supports is advisable and will help to provide access to the underground pipes and possible hot spots that need mitigation.

- The typical radius of influence of the SVE wells has been found to be 80-feet, at a wellhead vacuum pressure of 40-inches of water vacuum, and an extraction flow rate of 100 acfm. The typical radius of impact of the AS wells has been found to be 25-feet east-west and 40-feet north-south, at a wellhead pressure of 10 psi and an injection flow rate of 15 acfm.

3.0 SYSTEM UPGRADE TO FULL SCALE

3.1 Full Scale System Description

The upgrade elements required to bring the existing SVE/AS system to full scale are displayed on Engineering Drawings C-1, M-1, M-2, M-3, M-4, P-1 and P-2 which can be found in Appendix A. These elements are described below.

- **SVE Wells** – Four additional SVE wells will be needed to upgrade the pilot system to full scale capability. These additional wells will be placed along the centerline of the plume in a direction slightly north of east as displayed on the engineering drawings. Also, existing monitoring well MW-405S will be converted for use as an SVE well. All five of the wells will be connected to the existing SVE piping and will be operated using the existing SVE equipment.
- **AS Wells** – Sixteen additional AS wells will be needed to upgrade the pilot system to full scale. Two of these wells will be placed in the former dispenser area, two will be placed in the Freon plume area, two will be placed on either side of monitoring wells MW4I and MW4S, one will be placed off the north side of the buried concrete slab, one will be placed off the east end of the buried slab, and eight will be placed along the groundwater contaminant plume to the east of the existing pilot test system.
- **Ozone Injection Points** – Eight additional ozone injection points will be installed at the site at and down-gradient of MW-405S as shown on the drawings.
- **Monitoring Wells** – Existing well SV-3 will be converted for use as MW-20. No additional monitoring wells are needed for the full scale remediation.
- **Conveyances** – Pipe saddles will be used to mount conveyances to the existing SVE trunk line, and PVC piping will be run from those saddles to the new SVE wells and into the former Fuel Filtration Building where it will transition to flexible rubber piping for connection to the underground pipe stub-ups. Pipe saddles, fusion weld fittings or couplings will be used to mount conveyances to the existing AS supply pipes, and HDPE piping will be run from those connection points to the new AS wells and to other AS wells that are to be supplied by piping from different well groups. Ozone conveyances will be tubing in PVC pipe sleeves. The SVE and AS conveyance locations and mechanical details are displayed on the engineering drawings.
- **Ozone System** – A trailer-mounted ozone system capable of generating and injecting five pounds of ozone per day will be mobilized and placed at a convenient location on-site.
- **AS Manifold** – The blind flanged connection at the top of the existing AS manifold will be used for additional 1 ½-inch ABS piping with pressure gauge, butterfly valve, and flow meter. The ABS piping will transition to HDPE piping outside of the remediation building and will supply new sparge wells AS-23 and AS-24 as shown on the drawings.

- **Carbon Unit Conveyances** – The flanges on the ends of the flexible rubber pipes used to convey vapors into and out of the carbon treatment units will be changed out in favor of lighter flanges. A carbon steel spool-piece is located between two active carbon canisters and is used to obtain measurements and samples if needed during SVE operations. The length of this spool piece will be reduced as a means of reducing its weight.

3.2 O&M

The O&M of the full scale system, with a few exceptions, will be the same as for the pilot scale system and has been described in detail in the document entitled Draft Operations and Maintenance Manual for Soil Vapor Extraction/Air Sparging System dated June 3, 2005. A summary O&M description is provided below.

- **SVE/AS System Start-up** – The start-up will consist of a brief power-up (pre-start-up test) to verify basic function of the power supply, motors, blowers, lubricants, VSDs, set-point controls, instruments, and process controls. The results of the brief power-up will be evaluated and the system started again. This time the blowers will be run up to full unloaded function in a series of timed steps using the VSDs. During the run-up, the controls and instruments will be checked, unloaded blower performance will be verified, and power consumption will be verified. The blowers will then be stepped down to about 25% of their capacity, loaded by engaging the system conveyances and gradually closing bypass and exhaust valves, and allowed to run until temperatures and pressures remain constant. From that point, the blowers will be stepped up to full loaded function using the VSDs, and were allowed to run until temperatures and pressures remained constant. The equipment start-up sequence will then be complete.
- **Ozone System Start-up** – The ozone system start-up will begin with a review of the ozone system components and their operation. The system will be started up briefly to verify system function. Then the system will be connected to one of the ozone injection points, started and allowed to warm up and continue running. The system controls, monitoring equipment, performance parameters, and operating ranges will be reviewed during the initial phase of the system operation. The system will then be connected to additional injection points and the ozone injection work will begin.
- **Continuous Operations** – During the full scale operations, the SVE and AS systems will be subjected to multiple adjustments and test sequences that are described subsequently. The system will be inspected periodically, controls and instruments checked, motor and blower function checked, and pressures and temperatures checked to ensure that the operating conditions remain within the blower design limits.
- **Ongoing Maintenance** – The required maintenance activities include checks of lubricant levels, management of the moisture knockout tank, management of the carbon treatment system, and management of moisture that collected at times in the SVE influent pipes.
- **Project Controls** – During the O&M work at the site, the SHSP for Full Scale Installation and Operation for Soil Vapor Extraction/Air Sparging System and the

environmental protection provisions presented in the Pilot Study Results Report and Work Plan for Full Scale Installation and Operation for Soil Vapor Extraction/Air Sparging System will be in effect.

3.3 Monitoring and Measurement

Once the full scale system is operational, it will be shut down so that baseline measurements and monitoring can be performed as needed. Once the new baseline data is obtained, the system will start and the remediation will proceed.

During the full scale remediation, unlike the pilot test, environmental monitoring and measurement will generally be performed only on a monthly basis. Each month, the same type of measurements and analyses will be performed as were used for the pilot test. One exception will be the sampling of the SVE blower exhaust sampling port. This sampling will be done with a large tedlar bag to decrease detection limits and provide more accurate monthly estimates of contaminant mass removal.

3.4 Special Conditions

There are two areas at the site where special conditions apply to the planned remediation.

The first of these is the contamination zone beneath the buried concrete slab. This zone will require additional monitoring and treatment to reduce the initial contaminant concentrations, to oxygenate the general area, and to reduce the degree of toxicity that is currently preventing effective microbial growth.

The second is the former fueling facility, where demolition is recommended and may be underway during a portion of the full scale remediation. The mitigation of this area after the demolition is complete is likely to be somewhat observationally based, because features will be exposed after the demolition that are not currently visible or accessible.

4.0 SAMPLING AND ANALYSIS

A sampling and analysis program (SAP) will be implemented to verify the effectiveness of the remedial activities conducted at the NWIRP Calverton.

4.1 Air, Vapor and Activated Carbon

The following sections describe the air monitoring and testing activities that will be conducted during this remedial action.

4.1.1 Ambient Air Monitoring

The field team will monitor the ambient air quality as part of the health and safety surveillance program during the remedial activities. The following instruments will be used in accordance with the manufacturer's recommended calibration and maintenance procedures.

- PID (HNu with 11.7eV lamp or equivalent).
- Combustible Gas Indicator.

During air monitoring, the field team will generate data on the presence or absence of VOCs. If "hot spots" are found at the site, the health and safety protection levels/requirements and the technical approach to the affected tasks will be modified and implemented, depending on the action level.

4.1.2 PID Measurement During Drilling

Four new SVE, sixteen new AS wells and eight ozone injection points will be installed as part of the upgrade from pilot to full scale system. As the borings for these wells are drilled, borehole screening using a PID will be performed. The readings collected will be used both for health and safety purposes and to identify "hot spots" which may exist on-site. All screening readings, and the approximate depth within each boring at which the reading was collected, will be recorded in the field logbook and on the Boring Log.

In addition, soil headspace measurement with a PID will be performed on selected split-spoon samples collected from the depth of concern at each borehole. Each sample collected will be transferred directly from the stainless steel split spoon to a pre-cleaned, screw-top, air-tight glass jar using a clean stainless steel spoon. The sample jar will be identified, using permanent waterproof marker, with the location and depth of the sample and project number. After the sample jar has been prepared, the probe tip of the PID will be inserted into the container and a headspace reading will be collected. All field observations, including blow counts, headspace analysis results, evidence of contamination, and description of moisture content, will be recorded in the field logbook and on the boring log form.

4.1.3 Extracted Vapor Sampling

VOC concentrations in the extracted vapor will be measured with field instruments to estimate the efficiency of the extraction process. These field measurements will be collected weekly for the first quarter, and twice a month for the balance of the project. One extracted vapor sample will be collected from the outlet of the blower with a large tedlar bag on a monthly basis during the full scale operation. The sample will be submitted to the laboratory for VOC analysis in accordance with TO15 methodology.

4.1.4 Carbon Unit Sampling

VOC concentrations will be measured before, in between, and after the two carbon units using field instruments. PID readings will be collected periodically from sampling ports based on operating data, and projected carbon changeout requirements.

4.2 Sampling Groundwater/Wastewater

The following describes the sampling activities which will be conducted for groundwater sampling and disposal of the condensate, decontamination, well development, and purge water.

4.2.1 Groundwater Sampling

Groundwater samples were collected during the pre-design investigation and pilot study at the former fuel depot. The data was used to confirm the areal extent of groundwater contamination. Based on the results, no new monitoring wells will be installed; however, the SVE wells will be used as additional monitoring wells and there will be a total of 12 SVE wells.

Analytical results from the SVE wells and existing monitoring wells will be used to monitor the effectiveness of the AS component of the system. Groundwater monitoring will be performed monthly but the number of wells sampled will be based on field data findings.

In addition, one round of groundwater samples will be collected after six months of remediation is complete to document the groundwater conditions at the site.

Prior to performing the groundwater sampling, an initial well riser headspace reading and measurement for DO will be collected at each well. The headspace and DO data will be collected using portable field equipment. Static fluid level measurements, and the total depth of each well, will then be obtained using an oil/water interface probe or an electronic water level indicator. The depth to groundwater and the thickness of floating product, if present, will be determined in the well at the time of measurement. The fluid levels will be measured to the nearest 0.01 foot. The water levels and well depth measurements will be used to calculate the volume of water in each well and the minimum volume of water that must be purged prior to sampling.

Three to five well volumes will be purged from the wells prior to sampling. If the well is pumped or bailed dry, purging will be considered to be complete and an appropriate note will be recorded in the field logbook. While the well is being purged, field measurements of pH, temperature, and specific conductance will be recorded. If all three parameters stabilize, the volume of water purged will be recorded and purging will be considered to be complete. If the field parameters do not stabilize, purging will continue until three to five volumes have been purged. Field measurements for each well sampled will be recorded on a Groundwater Sample Log and in the field logbook.

After the purging has been completed, groundwater samples will be collected using disposable Teflon tubing or bailers.

4.2.2 Water Level Measurements

Prior to each round of groundwater sampling, water level measurements will be collected in each well using an electronic water level indicator. This unit has a tape divided into incremental measurements of 0.01 feet and two conductors forming a probe. When groundwater is encountered, the circuit is complete and a light or audible buzzer is activated. The depth to groundwater is then measured from this point to the reference mark of the inner casing of the well. Each reading will be recorded in the field logbook. The water level indicator will be decontaminated between wells to avoid cross contamination and incorrect readings. The water level measurements will be collected in ascending order of contamination, i.e., the water level in the most contaminated well will be measured last.

4.2.3 Decontamination and Well Development Water Sampling

The well development water will be segregated based on the location of the well from which it was derived. The development water will be segregated into potential RCRA-hazardous, potential Toxic Substances Control Act (TSCA)-hazardous, and potential non-hazardous. The decontamination water will be segregated with the potential non-hazardous well development water. Both the development and decontamination water will be containerized in 55-gallon drums for on-site storage and disposed of once every 90 days. Three composite samples, one composite sample from drums within each category, will be prepared and submitted for analysis. Each composite sample will be analyzed for Target Compound List (TCL) VOCs, TCL semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) Metals, polychlorinated biphenyls (PCBs), total organic halogens (TOX), specific gravity, ignitability, reactivity, and corrosivity.

4.2.4 Activated Carbon Sampling

Prior to off-site disposal, it will be necessary to sample and analyze the spent activated carbon to characterize the carbon. A grab sample will be collected from the carbon vessel and will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP Pesticides/Herbicides, TCLP Metals, PCBs, ignitability, reactivity, and corrosivity. Only one sample will be required to characterize the carbon and fulfill the carbon regeneration facility's pre-acceptance requirements.

4.3 Sampling Soil

4.3.1 Soil Borings

Subsurface soil samples were collected during the field investigation of the former fuel depot and additional samples will be collected as needed during the installation of additional wells.

4.3.2 Waste Characterization Soil Sampling

Waste characterization soil sampling will be conducted upon completion of the drilling activities. As discussed previously, the drill cuttings will be segregated based on the location of the well from which they were derived. The drill cuttings will be segregated into potential RCRA-hazardous, potential TSCA-hazardous, and potential non-hazardous. Three composite soil samples, one composite sample from drums within each category, will be prepared and submitted for analysis. Each composite sample will be analyzed for TCLP VOCs, TCLP SVOCs, TCLP Pesticides/Herbicides, TCLP Metals, PCBs, TOX, ignitability, corrosivity, reactivity, and the paint filter test for free liquids.

4.3.3 Laboratory Analysis

Analytical testing will be performed by a Navy and New York State Department of Environmental Conservation (NYSDEC) approved laboratory, following either NYSDEC Analytical Services Protocol – Contract Laboratory Program and/or SW-846 protocols. All of the soil and groundwater samples will be analyzed for TCL VOCs. Tables 4-1 and 4-2 summarize the analytical sampling program. Sample collection and analytical protocol information, including sample matrix, analytical parameter, sample container requirements, sample preservation, laboratory analysis, and holding times, is presented in Table 4-3.

5.0 ENVIRONMENTAL PROTECTION

The Environmental Protection Plan has been designed to protect sensitive environmental and natural resources while ensuring compliance with all applicable Federal, state and local regulations.

5.1 Applicable or Relevant and Appropriate Requirements (ARARs)

As a NYSDEC inactive hazardous waste site, actions at the site are conducted consistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Remedial actions are required to comply with, and upon completion attain ARARs. A requirement that is relevant and appropriate must be complied with to the same degree as if it were applicable. In addition to ARARs, regulatory agency advisories, criteria, or guidance may be identified as requirements "to be considered" (TBC).

Remedial actions conducted entirely on site need only comply with the substantive aspects of the ARARs/TBC and not the administrative aspects such as permitting (specifically exempted under CERCLA Section 121(e)) or administrative reviews. Activities off site must comply with all necessary Federal, state, and local laws; regulations; and ordinances (e.g., transportation of remedial action wastes must comply with local, state, and Federal transportation standards, both substantive and administrative). A list of project-specific ARARs/TBCs is presented in Table 5-1.

5.2 Mobilization

During site mobilization, TtEC will survey the site with the Contracting Officer and take photographs of the site.

5.3 Permitting Activities

As this is a remedial action under CERCLA, permits are not required for activities to be conducted on-site. Rather, TtEC will comply with the substantive requirements of the project ARARs.

5.4 Hazardous and Solid Waste Management

Any hazardous wastes generated during construction or operation and maintenance phases will be managed in accordance with Section 6.0, Waste Management.

5.5 Air Pollution Control

NYSDEC is authorized by the USEPA for enforcement of the Clean Air Act within New York State (NYS). The operation of the SVE system will result in VOC emissions, which will require the use of activated carbon to control VOC emissions. Any needed controls may be implemented in substantive compliance with the project ARARs. Fugitive dust emissions may result from project operations, and will be controlled using the best available technology. This may include keeping surfaces adequately wet to prevent fugitive dust emissions.

5.6 Endangered Species Act

The Endangered Species Act is not applicable to this project. No threatened or endangered species are known or suspected to exist in the area of the remedial action.

5.7 Protection of Trees and Shrubs

TtEC will not remove, cut, deface, injure, or destroy any trees or shrubs without the Navy's approval, and will protect existing trees which are to remain. TtEC will not attach ropes or cables or chains to existing trees for anchorage without Navy approval. Trees and other landscape features damaged by equipment operations will be replaced with equivalent undamaged trees and landscape features.

5.8 Spill Prevention

TtEC will take all the necessary precautions to prevent petroleum, hazardous wastes, and other hazardous substances from entering the ground surface, groundwater, or surface waters. All petroleum fuel, and hazardous waste containers and tanks will be equipped with secondary containment in accordance with 40 Code of Federal Regulations (CFR) 112 and 40 CFR 264.

5.9 Excursion and Release Reporting

An Emergency Response Section and a Spill Control Plan are both contained in the SHSP. Information contained in these sections details how TtEC will address spill control, prevention, and emergency response activities onsite.

5.10 Training and Certification Requirements for Project Personnel

Site personnel performing intrusive activities in any exclusion zones must have 40-hour Occupation Safety and Health Administration (OSHA) Hazardous Waste Worker Training. Site supervisory personnel will also have 24-hour on-the-job supervision, 8-hour refresher, 8-hour supervisor, and First Aid/Cardiopulmonary Resuscitation (CPR) with bloodborne pathogens training. Subcontractor personnel will be required to have training appropriate for the activities they will be required to perform.

Personnel performing hazardous waste management and/or hazardous material shipping activities will be trained in accordance with RCRA training requirements under 40 CFR 265.16, and United States Department of Transportation (USDOT) Hazardous Material Training under 49 CFR 172 Subpart H, respectively.

5.11 Inspections by Regulatory Agencies

Site personnel will contact the TtEC Project Superintendent (PS) if contacted by a regulatory agency for a site inspection. The TtEC PS will contact the TtEC Project Manager (PM), who will notify the EFANE Remedial PM, the TtEC Project Environmental and Safety Manager (PESM) and the TtEC Environmental, Safety, Quality (ESQ) Director. TtEC personnel will follow the TtEC procedure (Environment Health and Safety) EHS 1-10 External Regulatory Inspections and Notifications revised April 4, 2000. In the event of an unannounced inspection, the TtEC PM, Program Manager, PESM and ESQ Director will be contacted immediately.

5.12 Inspections by Third Parties

Any outside party requesting access to the site will be referred to the PS, who will initiate the appropriate notification of the PM and the EFANE Remedial PM. TtEC personnel will not grant site access or answer questions for unauthorized personnel.

5.13 CERCLA Release Reporting

CERCLA requires the immediate reporting of any release of a reportable quantity (RQ) of a hazardous substance onto land, surface or ground water, or air in any 24-hour period. Releases permitted under state or federal permits (i.e. National Pollutant Discharge Elimination System (NPDES)) are not subject to reporting. The materials regulated are hazardous substances and hazardous wastes listed in 40 CFR 302.4. Releases of petroleum products are not regulated under CERCLA (but are regulated under the Clean Water Act, and NYS Regulations). Immediately upon recognition that a reportable release has occurred, the person(s) in charge of the facility must notify by phone the National Response Center (NRC) and the State Emergency Response Center (SERC) and the Local Emergency Planning Committee (LEPC) established under the Emergency Planning and Community Right-to-Know Act (EPCRA). Ideally, TtEC would immediately report all releases to the Navy Representative who would in turn notify the NRC, the SERC, and the LEPC, but in the absence of the Navy Representative, TtEC would assume reporting responsibilities. A follow up written report must be submitted to the USEPA Region II Office, the SERC, and the LEPC within 30 days of the event.

- NRC - (800) 424-8802
- SERC - NYSDEC (800) 457-7362 or (518) 457-7362
- LEPC - Suffolk County (516) 852-4850

In addition, CERCLA contains a provision Section 111(g) that requires the facility operator to provide reasonable notice about a release of a hazardous substance to potentially injured parties by publication in local newspapers serving the affected area. TtEC assumes that the Navy will assume responsibility for all public notices.

5.14 EPCRA Release Reporting

Any person in charge of a facility must provide immediate notification whenever a RQ of an Extremely Hazardous Substance migrates off-site, this include releases to air, water or land. There is no reporting requirement if the release does not go off-site and only results in exposure to persons within the boundaries of the facility. Lists of Extremely Hazardous Substance are published in 40 CFR 372.65. If a material is listed on both the Extremely Hazardous Substance and CERCLA lists then the notification must be made to the LEPC, SERC and the NRC. If the material is listed on the Extremely Hazardous Substance, but not the CERCLA list then notification must only be made to the LEPC and the SERC. TtEC will report all Extremely Hazardous Substance releases to the Navy representative who will perform the required notification, except in the absence of the Navy when we will perform the notifications. The telephone numbers are the same as those for CERCLA reporting. Newspaper notification is not required for releases of Extremely Hazardous Substance.

5.15 Clean Water Act Reporting

Under the Clean Water Act, the facility operator must provide immediate notice by phone to the NRC whenever a RQ of oil or hazardous substance is released into a navigable water, or adjoining shoreline. Federally or state permitted releases (i.e. NPDES) are not subject to reporting. A RQ of oil is one that violates applicable water quality standards or causes a discoloration of or film onto the surface of the water. RQs of Clean Water Act regulated hazardous substances are published in 40 CFR 117. Although this facility is not identified as being adjacent to navigable water, a reportable release could occur if oil or hazardous material are released into tributaries, drainage swales, or storm drains which lead into navigable waters. TtEC will report all suspect release to the Navy Representative, in the absence of the Navy Representative TtEC will provide immediate notification to the NRC.

5.16 NYS Release Reporting

NYS regulates releases of petroleum and hazardous substances that has the potential to pollute the waters or lands of the state. The list of NYS Hazardous Substances is published in 6 New York Conservation Rules and Regulations (NYCRR) 597.2.

Any discharge of petroleum or hazardous substances must be reported to the NYSDEC, at (800) 457- 7362 or (518) 457-7362, within 2 hours of the discharge or knowledge of the discharge. Releases that are contained within secondary containment systems and do not reach the land or water are not required to be reported within 24 hours, if the release is completely contained and all material releases has been recovered. If a facility operator suspects a probable spill, then notification must be provided within 24 hours of the discovery.

Reporting requirements apply to facility owners and operators, persons in possession of a hazardous substance and any employee or agent of any owner or operator who has knowledge of a spill or release. These regulations are applicable to the site and if a release occurs, TtEC will report any releases to the Navy. If the Navy Representative is not available, TtEC will report any reportable releases to the NYSDEC.

6.0 WASTE MANAGEMENT

6.1 Introduction

The objective of Waste Management is to ensure the safe handling, management, transportation and disposal of all waste streams generated during the remedial action. In addition, each of these activities will be conducted in compliance with project ARARs/TBCs for on-site waste management activities and all applicable Federal, NYS, and local requirements for off-site waste transportation and disposal.

6.2 Waste Classification

The following is an overview of the classification requirements for wastes generated during the remedial action. Refer to Table 6-1, Summary of Waste Materials, for a summary listing of classification and disposition requirements by individual waste stream.

6.3 Hazardous Wastes

Pursuant to 40 CFR 262.11 and 6 NYCRR 371, generators are required to classify their wastes prior to disposal. Based on the Statement of Work, listed hazardous wastes are not expected to be present on site. We anticipate that any drilling soils, SVE condensate water, activated carbon, and well development water generated from the remediation of the Former Fuel Depot would be classified as non-hazardous based upon the RCRA exemption (40 CFR 261.4(b0(10) for contaminated environmental media from petroleum UST corrective action. Unless the soils or groundwater contain PCBs or fail TCLP for metals, or for non-petroleum organics (chlorinated solvents, pesticides or herbicides), the soils and contaminated groundwater would be classified as non-hazardous waste. SVE condensate or spent activated carbon would not be regulated as environmental media and may be RCRA hazardous if they fail TCLP for metals or organics.

The project Regulatory Specialist will confirm these waste classification assumptions by reviewing the analytical data developed for each remedial action waste stream prior to off-site transportation and disposal. A waste certification and Waste Profile Sheet will be provided to the Navy for review, approval, and generator signature prior to off-site disposal of each waste stream.

6.4 PCB Wastes

Based upon the site history and former operations conducted, PCBs above 50 parts per million (ppm) are not expected to be present in the former fuel farm depot area. Soils or groundwater containing less than 50-ppm PCBs will be managed as non-hazardous solid wastes for disposal. If soils or groundwater containing 50 or more ppm of PCBs are identified, they will be segregated for management as a TSCA waste and disposed at a TSCA permitted disposal facility. PCB wastes will be managed and disposed in accordance with requirements under TSCA 40 CFR 761 and NYS Hazardous Waste Regulations under 6NYCRR 370-375 because PCBs are regulated as a NYS Hazardous Waste. Any decontamination water derived from soils containing greater than 50-ppm of PCBs will be disposed as TSCA wastes in accordance with the anti-dilution provisions of TSCA. SVE Condensate and Well Development and Purge waste will be as TSCA wastes only if they are determined to contain greater than or equal to 50-ppm of PCB's in accordance with USEPA Guidance Memorandum "PCB Contamination at Superfund Site - Relationship of TSCA Anti-Dilution Provision to Superfund Response Actions" dated July 31, 1990.

6.5 Screening/Segregation

Wastes will be screened and segregated to minimize the mixing of contaminated and uncontaminated materials. The goal is to separate waste as accurately as possible into categories that will facilitate cost-effective management of the wastes.

6.6 Containerization

USDOT specification 1A1 (closed top) and 1A2 (open top) steel drums will be used for containerizing the non-bulk waste streams generated for this remedial action.

6.7 Accumulation/Storage

All containers storing hazardous wastes will remain on-site for no more than 90 days from its accumulation start date unless specific approval has been received from NYSDEC. Containers holding non putresible solid wastes will remain on-site for no more than one year from their accumulation start date. TtEC will obtain NWIRP Calverton specific storage requirements from the Resident Officer in Charge of Construction (ROICC) prior to mobilization and will incorporate these requirements into the project plan. All on-site hazardous waste storage will comply with generator requirements listed in 40 CFR 262 and 6CNYRR 372. If TSCA regulated PCB wastes are identified, all on-site PCB waste storage will be conducted in accordance with PCB container storage requirements under 40 CFR 761.65. All waste container storage areas for RCRA Hazardous, TSCA or liquid wastes will be equipped with secondary containment.

6.8 Container Inspections

Hazardous waste and PCB waste container inspections will be performed and logged weekly to ensure proper labeling and marking, and to monitor the condition of the containers and the condition of the storage area. The weekly inspection reports will be maintained in the project file and copies will be provided to the Navy.

6.9 Container Labeling and Marking

At the time of generation, all waste containers will be marked in indelible ink, paint or grease pencil with the following information:

- Source and location.
- Contents of material in the container and expected hazards.
- Accumulation start date for hazardous wastes.
- Out of Service Date for PCB wastes.
- Date container was sampled.
- HAZARDOUS WASTE label if known or suspected to contain hazardous wastes.
- PCB label if known or suspected to contain PCB wastes.
- NON-HAZARDOUS WASTE label if known or suspected to contain non-hazardous wastes.

Upon receipt of analytical results, the waste will be classified by the Regulatory Specialist, in consultation with EFANE personnel, in accordance with applicable regulations. Based upon final classification, the Regulatory Specialist will select a proper USDOT Shipping name and description for any USDOT regulated hazardous materials. The Regulatory Specialist will direct the completion of any required USDOT markings and labels and will specify the placarding requirements for the transportation vehicle.

6.10 Permitting/Notification Requirements

Since hazardous and PCB wastes have been generated from previous remedial activities at NWIRP-Calverton, the Navy has already performed the required RCRA and PCB waste notifications to USEPA and obtained the required Generator USEPA Identification numbers. No additional notifications are required for on-site waste management activities. No permits are required for site activities.

6.11 Selection and Identification of Treatment, Storage and Disposal Facilities (TSDFs)

TSDFs to be used for this project have not yet been selected and will be selected via competitive bid in accordance with Federal Acquisition Regulation requirements. A Formal Request for Proposal will be prepared after project mobilization. Facilities will be selected in accordance with the requirements of the Request for Proposal, the CERCLA Off-site Rule for wastes from CERCLA sites and TtEC Regulatory Compliance Procedures. Each of these facilities is subject to final approval by the Navy. The CERCLA Off-Site approval status of each facility will be verified within 60 days of the anticipated disposal date.

6.12 USEPA Hazardous Waste Generator Identification Numbers

The Navy's USEPA Hazardous Waste Generator Identification Numbers will be obtained and used for all off-site hazardous and PCB waste disposal. Transporter and disposal facility identification numbers would also be obtained and verified prior to off-site shipment of site wastes.

6.13 Complete Manifest Packages

Hazardous Waste Manifests will be used for all off-site Hazardous and PCB waste shipments. The state hazardous waste manifest to be used will be specified by the state in which the TSDF is located. If the TSDF state does not require its own manifest, then a NYS Hazardous Waste Manifest will be used. Bills of Lading or non-hazardous waste manifests will be used for shipment of all non-hazardous wastes. A Complete Manifest Package (CMP) will be submitted to the Navy for each waste stream destined for off-site disposal. The principal components of the CMP will consist of:

- Hazardous Waste Manifests or Bills of Lading.
- Waste Profile Sheets.
- Land Disposal Restriction Waste Notification Forms, if required.

Supporting documentation will include Material Safety Data Sheets (MSDS), waste disposal history, analytical results, waste certifications performed by TtEC, information reviewed in identifying the proper USEPA waste codes and USDOT Proper Shipping Names, and packaging, labeling, and marking requirements.

TtEC will submit a CMP to the Navy for each waste stream for review and approval prior to shipment. After the CMP has been approved and signed, two copies of the approved and signed CMP will be prepared. One copy will be placed in the project file and one copy will be returned to the Navy with the transporter-signed copies of the manifests and Bills of Lading.

6.14 Recordkeeping and Reporting Requirements

TtEC will supply the following documents to the Navy to enable the Navy to comply with the records retention and reporting requirements under RCRA:

- Generator signed manifests.
- TSDF signed manifests.
- Land Disposal Restriction Waste Notification Forms.
- Manifest Discrepancy and Exception Reports.
- Waste Profile Sheets.
- TSDF Certificates of Disposal/Destruction.
- All test results, waste analyses and waste determinations.

These records will be supplied in the CMP with a duplicate submitted in the Project Closeout Report.

Discrepancy Reports will be prepared for the Navy's approval and signature for any manifest discrepancy related to waste type or volume. These reports will be prepared and submitted within 15 days after waste receipt by the TSDF.

Manifest Exception Reports are required if a generator does not receive a TSDF signed manifest within 45 days of the shipment date. If TtEC does not receive a manifest by the 35th day, TtEC will contact the TSDF and verify the shipment status and prepare an Exception Report, which will be submitted to the Navy Representative for approval and signature by the 40th day. TtEC will document all calls to locate the shipment and include the documentation in the Exception Report.

7.0 CRITICAL PATH METHOD (CPM) PROJECT SCHEDULE

TtEC has prepared CPM type construction schedules for the installation of the SVE/AS system. The schedule is provided in Figure 7-1. A normal 8-hour, 5-day work week is assumed. Start-up is scheduled for October 2005.

8.0 QUALITY CONTROL (QC)

TtEC RAC Program Organization is specifically designed to control work performed by the TtEC team in accordance with the contract requirements. TtEC will manage this contract though the dedicated Program Management Office (PMO) located in Langhorne, Pennsylvania.

The RAC program is organized into four (4) elements under the Program Management Team:

- Contract Administration.
- QC.
- Health and Safety.
- PM.

The PMO also provides support groups, which provide additional assistance to the Project Management Team on an as-needed basis.

The PMO support groups themselves are organized into five (5) elements:

- Procurement.
- Planning and Scheduling.
- Cost Estimating.
- Budgeting and Accounting.
- Technical and Regulatory Compliance.

Five of the above elements (Contract Administration, Planning and Scheduling, Cost Estimating, Budgeting and Accounting, and Technical and Regulatory Compliance) are non-remediation related and are not addressed in this QC Plan. The major function of the QC Plan is to ensure that all organization elements perform the assigned actions in compliance with the contract.

The QC plan provides for monitoring, auditing and conducting field inspections to ensure compliance is being maintained. Maintenance on the project records and required reports and logs is also addressed. A program to ensure all submittals are correct and complete before forwarding to the Contracting Officer's Representative is included in this QC Plan.

8.1 QC Group

The QC Group assigned to the Program is technically responsible to the TtEC Corporate Quality Assurance Officer. The Group is headed by the Program QC Manager (PQCM) who receives administrative direction from the Program Manager for the purpose of coordinating QC activities with the CTO operations, testing sequences and schedule, and achieving timely resolution of quality issues.

The QC Group consists of the PQCM and the Site QC Manger (SQCM).

8.1.1 PQCM

The PQCM is responsible for the following:

- Approving the QC Plan for the project.
- Assuring that all relevant portions of the QC Plan are implemented during the project through audits and surveillance of the project activities.
- Issuing report to the CTO Manager on any deviation from the approved plans.
- Reviewing, modifying or correcting all contract submittals prior to forwarding to the Contracting Officer's Representative.
- Authorizing the SQCM to act on his behalf for all Site related QC activities.

The PQCM is Mr. Tom Kelly (see Appendix B Resumes).

8.1.2 SQCM

The SQCM will implement the TtEC QC Program and will have the sole responsibility of ensuring compliance with contract documents. He will have the authority to reject material or workmanship that does not comply. The SQCM, or a designated representative acceptable to the Navy, will be present at the project Site whenever remedial actions are in progress. The major responsibilities of the SQCM as outlined in Section C Part 6.0 of the basic contract include the following:

- Managing and implementing an effective QC Program.
- Notifying the Contracting Officer's Representative at least one (1) week in advance of any field activities and at least 24 hours in advance of any cancellations in work.
- Conducting QC meetings at the Site with the PS on a bi-weekly basis.
- Providing documentation of daily field activities in the Contractor Production Report and the Construction QC Report.
- Identifying, controlling, and assuring resolution of deficiencies, including corrective action implementation.
- Maintaining project records as required by the contract or statue.

The SQCM is Mr. Jonathan Dziekan (see Appendix B Resumes).

8.2 QC Site Activities

8.2.1 Introduction

This section addresses all aspects of QC Site Activities, including the following:

- QC inspection activities.
- Identification of work features to be inspected.
- Control of subcontractors and vendors.

8.2.2 Three Phases of Control

The SQCM will perform the three phases of control to ensure that work compiles the SHSP, and all applicable federal, state, and local rules and regulations. The Three Phases of Control, as defined below, will adequately cover both on-site and off-site activities for each definable feature of work. A definable feature of work is a task that is separate and distinct from other tasks and requires separate control requirements.

8.2.2.1 Preparatory Phase

The SQCM will notify the Contracting Officer's Representative at least two work days in advance of each preparatory phase inspection to allow for their participation in the inspection, if desired. Preparatory phase inspections will be documented on the Preparatory Phase Inspection Checklist and in the Construction QC Report. The SQCM will perform the following prior to the commencement of each definable feature of work:

- Review each paragraph of the applicable Work Plan sections.
- Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.
- Review the testing plan and ensure that provisions have been made to provide the required QC testing.
- Examine the work area to ensure that the required preliminary work has been completed.
- Examine the required materials, equipment, and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data.
- Review the SHSP and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required MSDS are submitted.
- Discuss remedial methods.

8.2.2.2 Initial Phase

The SQCM will notify the Contracting Officer's Representative at least two work days in advance of each initial phase notification. When remedial crews are ready to start work on a definable feature of work, the initial phase will be conducted with the SQCM and the PS. The initial segment of the definable feature of work will be observed to ensure that the work complies with contract requirements. The results of the initial phase will be documented on the Initial Inspection Checklist and in the Construction QC Report. The initial phase will be repeated for each new crew to work on-site, or when acceptable levels of specified quality are not being met. The SQCM will perform the following for each definable feature of work:

- Establish the quality of workmanship required.
- Resolve conflicts.
- Review the SHSP and the appropriate activity hazard analysis to ensure that applicable safety requirements are met.
- Ensure that testing that needs to be performed is completed by an approved laboratory.

8.2.2.3 Follow-up Phase

Follow-up phase inspection are similar in content and approach to initial phase inspections, and will be performed as needed during on-going work daily, or more frequently as necessary, until the completion of each definable feature of work. The follow-up phase inspection will be documented in the Construction QC Report. The SQCM will perform the following for each definable feature of work:

- Ensure the work is in compliance with contract requirements.
- Maintain the quality of workmanship required.
- Ensure that testing is performed by the approved laboratory.
- Ensure that rework items are being corrected.

8.2.3 Work Features Requiring Inspection or Testing

Prior to implementation of individual phases of work activities, the SQCM and PS will meet to identify specific work requirements, including submittal information, scheduling, and QC requirements. This joint review allows close coordination of work and maximizes efficiency of operations. Project roles, potential problems, and procedures for resolving issues will be established up-front at these discussions to allow for clarification of direction and immediate response to any problem that may arise. As a results of this approach, QC activities will be, maintained as an integral component of the overall project approach.

8.2.4 Completion Inspection

At the completion of all work or any increment thereof, the ROICC will conduct a completion inspection of the work.

8.2.5 Control of Subcontractors and Vendors

Construction subcontractor's qualifications to perform the required work will be evaluated by the SQCM. All subcontractor activities will be subject to QC inspection in accordance with Section C, Part 6.0 of the Basic Contract.

8.3 Documentation

8.3.1 General

All inspection and testing activities performed will be documented by the SQCM.

8.3.2 Daily Quality Control Report

The SQCM or their designee will record their inspection activities in the Construction QC Report. The Construction QC Report will be submitted to the Contracting Officer's Representative daily. Reports for weekends and holidays will be included on the first working day's report following those periods.

8.4 Meetings

8.4.1 Pre-Construction Meeting

Prior to mobilization, the PS will conduct a pre-construction meeting in the ROICC office. The ROICC will approve the date and time for the pre-construction meeting.

8.4.2 Daily Safety Meeting

Prior to starting work, a daily safety meeting will be conducted by the TtEC PS or Site Health and Safety Officer (SHSO). All of the day's planned activities will be reviewed with particular attention focused on personal protective equipment (PPE) and risk. All personnel are required to attend the meeting.

8.4.3 Photographic Documentation

If permission is obtained from the Public Affairs Office, photographs of the remedial activities will be included in the Project Closeout Report.

FIGURES